

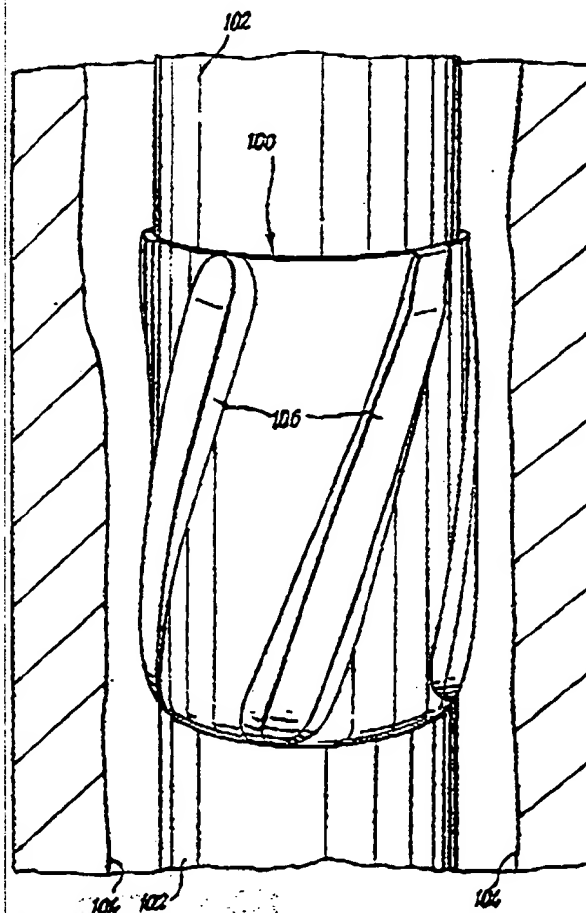
INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

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<p>(21) International Application Number: PCT/GB98/00554</p> <p>(22) International Filing Date: 23 February 1998 (23.02.98)</p> <p>(30) Priority Data: 9703608.1 21 February 1997 (21.02.97) GB</p> <p>(71) Applicant (for all designated States except US): DOWNHOLE PRODUCTS PLC (GB/GB); Badenroy Road, Badenroy Park, Portlethen, Aberdeen AB12 4YA (GB).</p> <p>(72) Inventors; and (75) Inventors/Applicants (for US only): KIRK, Ian, Alastair [GB/GB]; Lindons, 131 North Deeside Road, Milltimber, Aberdeen AB13 0JF (GB). BARRON, William [GB/GB]; 61 Seafield Road, Aberdeen AB15 7YU (GB). CLARK, Alistair, Bertram [GB/GB]; 7 Westwood Grove, Westhill, Aberdeen AB32 6XF (GB).</p> <p>(74) Agent: MURGITROYD & COMPANY; 373 Scotland Street, Glasgow G5 8QA (GB).</p>	<p>(81) Designated States: AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CU, CZ, DE, DK, EE, ES, FI, GB, GE, GH, GM, GW, HU, ID, IL, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, UA, UG, US, UZ, VN, YU, ZW, ARIPO patent (GH, GM, KE, LS, MW, SD, SZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, ML, MR, NE, SN, TD, TG).</p> <p>Published With international search report. Before the expiration of the time limit for amending the claims and to be republished in the event of the receipt of amendments.</p> <div data-bbox="1380 840 1542 1071" style="text-align: right;"> <p>JOE33 U.S. PTO 09/370058 08/23/99</p> </div>	

(54) Title: CASING CENTRALISER

(57) Abstract

A casing centraliser and assembly comprising a tubular and a centraliser, the centraliser comprising a plastics material.



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1 "CASING CENTRALISER"

2

3 The invention relates to a casing centraliser.

4

5 When a well has been drilled for the eventual
6 production of hydrocarbons, one of the procedures
7 commonly employed in readying the well for production
8 comprises installing hollow tubular casing in the well
9 to line the borehole. The space between the exterior
10 of the casing and the sides of the borehole are filled
11 with cement, which acts as a sealant and provides
12 mechanical support for the casing. As it is desirable
13 that the casing be centralized in the well bore when
14 cemented, proposals have been made for providing the
15 casing (prior to cementing) with externally mounted
16 centralisers to hold the casing away from the well bore
17 and towards the centre of the bore.

18

19 In accordance with the present invention, a casing
20 centraliser comprises an annular body, a substantially
21 cylindrical bore extending longitudinally through the
22 body, the annular body comprising a plastic,
23 elastomeric and/or rubber material, the bore being a

1 clearance fit around the tubular casing to be
2 centralised by the centraliser.

3

4 In a preferred embodiment the invention provides a
5 casing centraliser assembly comprising tubular casing
6 and a centraliser as defined above.

7

8 Typically, the plastic, elastomeric and/or rubber
9 material may comprise polytetrafluoroethylene (PTFE),
10 polyetheretherketone, carbon reinforced
11 polyetheretherketone, polyphthalamide, polyvinylidene
12 fluoride, polyphenylene sulphide, polyetherimide,
13 polyethylene, polysulphone, polyethersulphone,
14 polybutyleneterephthalate, polyetherketoneketone,
15 polyamides, rubber & rubber compounds, phenolic resins
16 or compounds, thermosetting plastics, thermoplastic
17 elastomers, thermoplastic compounds or thermoplastic
18 polyester resins.

19

20 In one example of the invention, the plastic,
21 elastomeric or rubber material may contain a filler
22 material, such as glass, carbon, PTFE, silicon,
23 molybdenum disulphide, graphite, oil or wax, or any
24 combination of these materials.

25

26 The annular body may be manufactured from and consist
27 of the plastic, elastomeric and/or rubber material.
28 However, the annular body may comprise a combination of
29 the plastic, elastomeric and/or rubber material and
30 another material such as a metal. For example, the
31 annular body may comprise a metal skeleton or other
32 structure coated, or partially coated, with the
33 plastic, elastomeric or rubber material. In addition,
34 or as an alternative, the annular body may comprise a
35 combination of different plastic, elastomeric and/or

1 rubber materials.

2

3 Preferably the centraliser further comprises a
4 peripheral array of a plurality of longitudinally
5 extending blades circumferentially distributed around
6 said body to define a flow path between each
7 circumferentially adjacent pair of said blades, each
8 said flow path providing a fluid flow path between
9 longitudinally opposite ends of said centraliser, each
10 said blade having a radially outer edge providing a
11 well bore-contacting surface.

12

13 Said centraliser is preferably free of any means
14 tightly gripping a casing when said centraliser is
15 installed thereon, whereby said centraliser and said
16 casing are mutually rotatable.

17

18 Said blades are preferably mutually substantially
19 equidistantly distributed around said body. Said blades
20 preferably each extend circumferentially at least
21 part-way around said body between longitudinally
22 opposite ends thereof to provide a circumferential
23 distribution of each said well bore-contacting surface.
24 Each said blade preferably has a radially inner root
25 integral with said body, each said radially inner root
26 preferably being circumferentially wider than the
27 respective radially outer edge. Said blades are
28 preferably circumferentially wider at one end of the
29 centraliser than at the other end, said one end
30 preferably the lower end of the centraliser in use
31 thereof. Said centraliser preferably has five of said
32 blades.

33

34 Longitudinally opposite ends of said blades and/or of
35 said body may be chamfered or tapered whereby to

1 facilitate passage of said centraliser down a well
2 bore.

3

4 Examples of a casing centraliser in accordance with the
5 invention will now be described with reference to the
6 accompanying drawings, in which:-

7

8 Fig. 1 is a perspective view from above and to one
9 side of a first example of a casing centraliser;

10 Fig. 2 is a plan view from above of the first
11 example;

12 Fig. 3 is an underneath view of the first example;
13 Figs. 4 and 5 are respectively radial (plan) and
14 circumferential (side) views of a blade forming
15 part of the first example;

16 Fig. 6 is a perspective view of a casing
17 centraliser mounted on casing in a borehole.

18

19 Referring first to Figs. 1 to 3, a casing centraliser
20 10 is a unitary annulus comprising a generally
21 cylindrical body 12, and an array of five
22 equiangularly-spaced blades 14 integrally formed with
23 the body 12. A cylindrical bore 16 extends
24 longitudinally and coaxially through the body 12, the
25 bore 16 having a substantially uniform diameter
26 dimensioned to be a clearance fit around the well bore
27 casing (not shown in Figs. 1 to 8). Each of the blades
28 14 (see also Figs. 4 and 5) not only extends between
29 longitudinally opposite ends of the body 12, but also
30 extends circumferentially part-way around the periphery
31 of the centraliser 10. The skewing of the blade 14
32 ensures that their respective radially outer edges 18
33 collectively provide a circumferentially substantially
34 uniform well bore-contacting surface for the
35 centraliser 10, as most particularly shown in Figs. 2

1 and 3.

2

3 Each of the blades 14 has a respective radially inner
4 root 20 integral with the body 12. In each of the
5 blades 14, the root 20 has a greater circumferential
6 width than the outer edge 18, ie the cross-section of
7 each blade 14 tapers towards the well bore-contacting
8 periphery of the centraliser 10. The individual and
9 collective shapes of the blades 14, and of the
10 longitudinal fluid flow passages defined between
11 adjacent pairs of the blades 14, gives the centraliser
12 10 improved flow characteristics and minimises the
13 build-up of trapped solids during use of the
14 centraliser 10.

15

16 Longitudinally opposite ends of the blades 14, and of
17 the body 12, are chamfered to assist in movement of the
18 centraliser 10 up/down a well bore.

19

20 Although the blades 14 are shown separately from the
21 body 12 in Figs 4 and 5 (and while the blades 4 could
22 be separately formed and subsequently attached to the
23 body 12 by any suitable means) it is preferred that the
24 entire centraliser 10 be fabricated as a one-piece
25 article.

26

27 The centraliser 10 may be manufactured entirely from a
28 plastics, elastomeric and/or rubber material.

29 Alternatively, the centraliser may comprise a metal
30 body coated, or partially coated, with a plastic,
31 elastomeric and/or rubber material.

32

33 Examples of possible plastic, elastomeric and/or rubber
34 materials are polytetrafluoroethylene (PTFE),
35 polyetheretherketone, carbon reinforced

1 polyetheretherketone, polyphthalamide, polyvinylidene
2 fluoride, polyphenylene sulphide, polyetherimide,
3 polyethylene, polysulphone, polyethersulphone,
4 polybutyleneterephthalate, polyetherketoneketone,
5 polyamides, rubber & rubber compounds, phenolic resins
6 or compounds, thermosetting plastics, thermoplastic
7 elastomers, thermoplastic compounds or thermoplastic
8 polyester resins.

9
10 The plastics, elastomeric and/or rubber material may
11 contain a filler. Examples of possible fillers are
12 glass, carbon, PTFE, silicon, molybdenum disulphide,
13 graphite, oil or wax, or any combination of these
14 materials.

15
16 Use of a plastic, elastomeric and/or rubber material
17 gives a number of advantages, including:- chemical
18 resistance, such as resistance to acid; non-sparking
19 (ie sparks are not generated if the centraliser 10
20 collides with steel); and, materials such as PTFE give
21 superior bearing properties.

22
23 Since the bore 16 is a clearance fit around the casing
24 and since the bore 16 lacks any means of tightly
25 gripping a normally dimensioned casing, the centraliser
26 10 can not only rotate freely around the casing but
27 also move freely along the casing (unless and until the
28 centraliser collides with an obstruction, for example a
29 protruding casing joint). Thus to provide longitudinal
30 restraint for the centraliser 10 to retain the
31 centraliser substantially at its preferred location
32 along the casing but without impairing the relative
33 rotatability of centraliser and casing, use is made of
34 a stop collar 50, as illustrated in Fig. 6.

35

1 Fig. 6 shows a modified form of casing centraliser 100,
2 fitted around hollow tubular casing 102 which is
3 located within a well bore 104. The modified
4 centraliser 100 is essentially the same as the
5 centraliser 10 described above, and differs principally
6 in the dimensions and proportions of its blades 106.
7 In particular, the blades 106 are circumferentially
8 wider at the lower end of the centraliser 100 than they
9 are at the upper end. Fig. 6 also illustrates the
10 manner in which the centraliser will hold casing out of
11 direct contact with the well bore and centrally within
12 the well bore, in preparation for subsequent cementing.
13

14 In the case of casing located within larger diameter
15 casing, centralisers can be employed on the inner
16 casing to hold it out of direct contact with the outer
17 casing.
18

19 Advantages of the invention are that the use of a
20 plastics, elastomeric and/or rubber material for the
21 centraliser helps to provide chemical resistance, such
22 as resistance to corrosion from acid. Other advantages
23 are that the materials are generally non sparking and
24 that certain materials, for example PTFE, have superior
25 bearing properties.
26

1 Claims:

2 1 A casing centraliser comprising an annular body,
3 and a substantially cylindrical bore extending
4 longitudinally through the body, the bore being a
5 clearance fit around tubular casing to be centralised
6 by the centraliser, characterised in that the annular
7 body comprises a plastic, elastomeric and/or rubber
8 material,

9
10 2 A casing centraliser as claimed in claim 1 wherein
11 the plastic, elastomeric and/or rubber material
12 comprises polytetrafluoroethylene (PTFE),
13 polyetheretherketone, carbon reinforced
14 polyetheretherketone, polyphthalamide, polyvinylidene
15 fluoride, polyphenylene sulphide, polyetherimide,
16 polyethylene, polysulphone, polyethersulphone,
17 polybutyleneterephthalate, polyetherketoneketone,
18 polyamides, rubber & rubber compounds, phenolic resins
19 or compounds, thermosetting plastics, thermoplastic
20 elastomers, thermoplastic compounds or thermoplastic
21 polyester resins.

22
23 3 A casing centraliser as claimed in claim 1 or
24 claim 2, wherein the plastic, elastomeric or rubber
25 material contains a filler material.

26
27 4 A casing centraliser as claimed in claim 3 wherein
28 the filler material comprises glass, carbon, PTFE,
29 silicon, molybdenum disulphide, graphite, oil or wax,
30 or any combination of these materials.

31
32 5 A casing centraliser as claimed in any preceding
33 claim, wherein the annular body consists of the
34 plastic, elastomeric and/or rubber material.

35

1 6 A casing centraliser as claimed in any one of
2 claims 1-4, wherein the annular body comprises a
3 combination of plastic, elastomeric and/or rubber
4 material and another material.

5

6 7 A casing centraliser as claimed in claim 6,
7 wherein the annular body comprises a metal skeleton or
8 other structure coated, or partially coated, with
9 plastic, elastomeric or rubber material.

10

11 8 A casing centraliser as claimed in any preceding
12 claim, having a peripheral array of a plurality of
13 longitudinally extending blades circumferentially
14 distributed around the body of the centraliser to
15 define a flow path between each circumferentially
16 adjacent pair of said blades, each said flow path
17 providing a fluid flow path between longitudinally
18 opposite ends of said centraliser, each said blade
19 having a radially outer edge providing a well bore-
20 contacting surface.

21

22 9 A casing centraliser as claimed in claim 8,
23 wherein the blades are mutually substantially
24 equidistantly distributed around the body.

25

26 10 A casing centraliser as claimed in claim 8 or
27 claim 9, wherein the blades each extend
28 circumferentially at least part-way around said body
29 between longitudinally opposite ends thereof to provide
30 a circumferential distribution of each said well bore-
31 contacting surface.

32

33 11 A casing centraliser as claimed in any of claims
34 8-10, wherein each blade has a radially inner root
35 integral with said body, each said radially inner root

1 preferably being circumferentially wider than the
2 respective radially outer edge.

3

4 12 A casing centraliser as claimed in any of claims
5 8-11, wherein the blades are preferably
6 circumferentially wider at one end of the centraliser
7 than at the other end, said one end preferably the
8 lower end of the centraliser in use thereof.

9

10 13 A casing centraliser as claimed in any of claims
11 8-12, wherein said centraliser preferably has five of
12 said blades.

13

14 14 A casing centraliser as claimed in any of claims
15 8-13, wherein longitudinally opposite ends of said
16 blades and/or of said body may be chamfered or tapered
17 to facilitate passage of said centraliser down a well
18 bore.

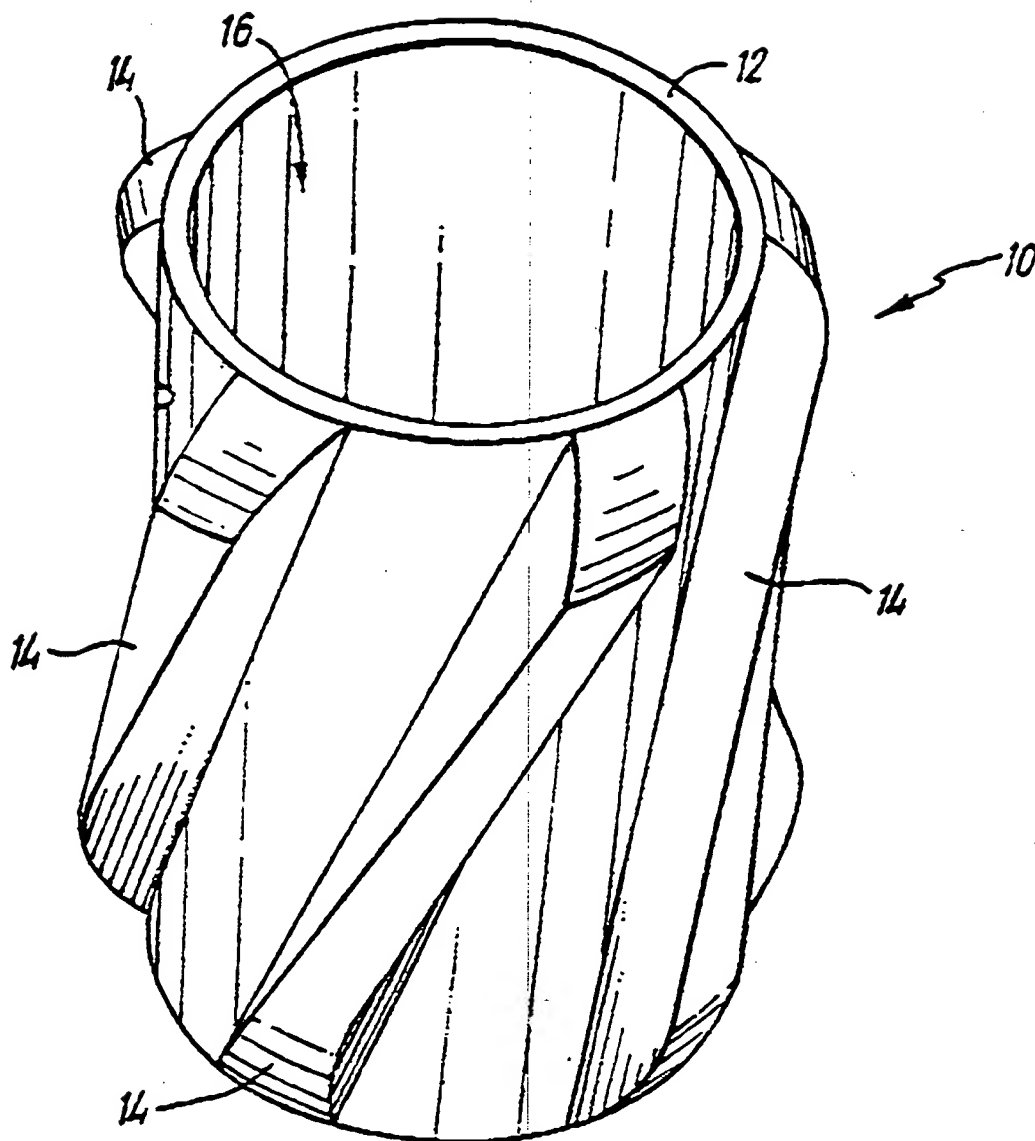
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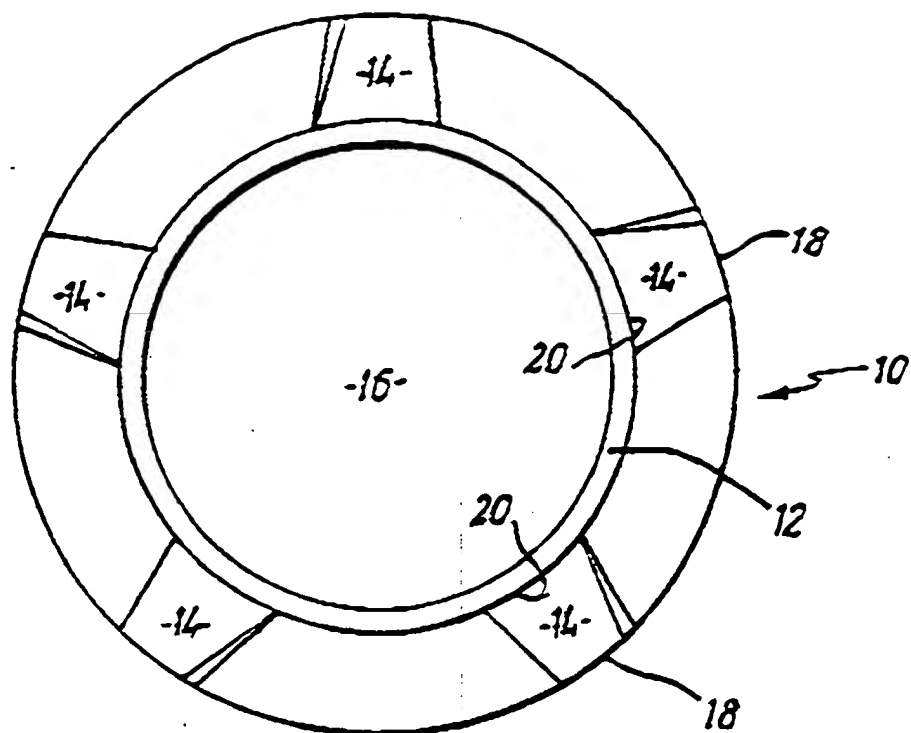
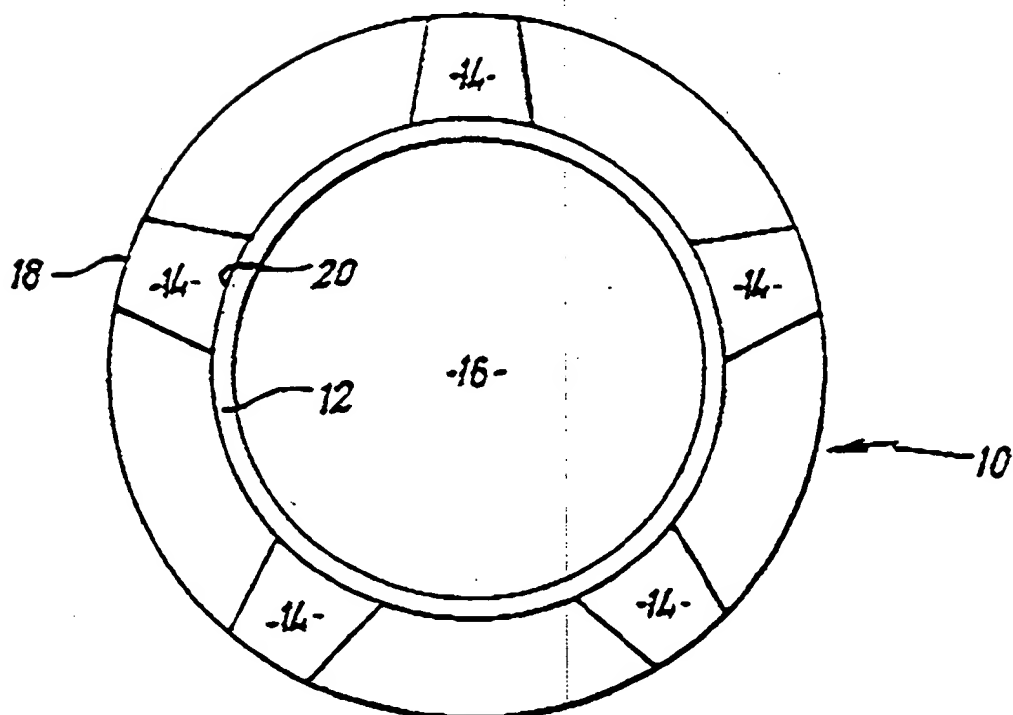
20 15 A casing centraliser as claimed in any preceding
21 claim, substantially free of any means tightly gripping
22 a casing when said centraliser is installed thereon,
23 whereby said centraliser and said casing are mutually
24 rotatable.

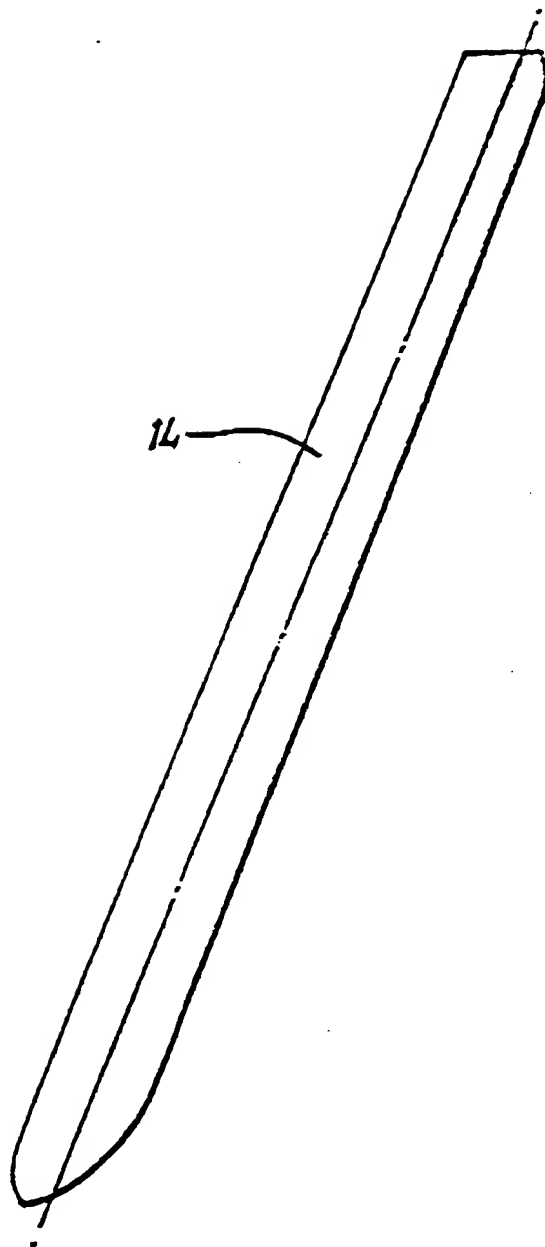
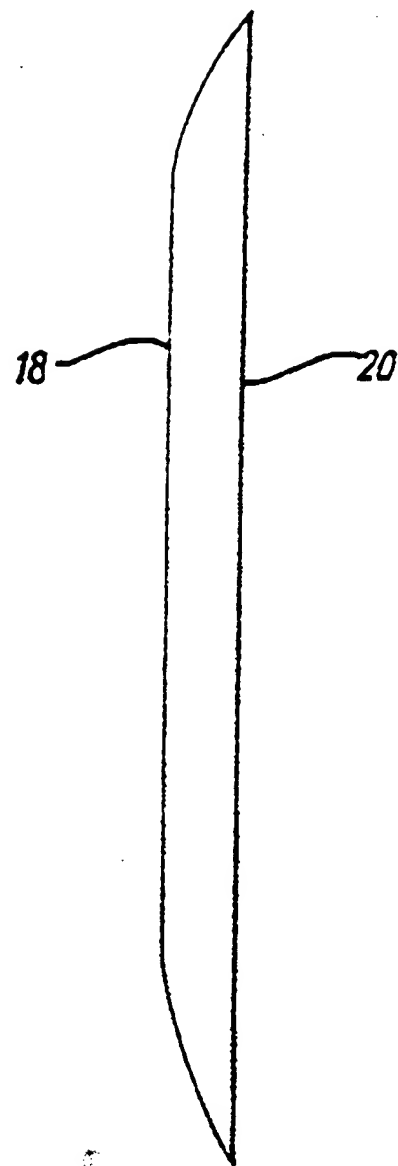
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26 16 A casing centraliser assembly comprising tubular
27 casing and a centraliser as claimed in any preceding
28 claim.

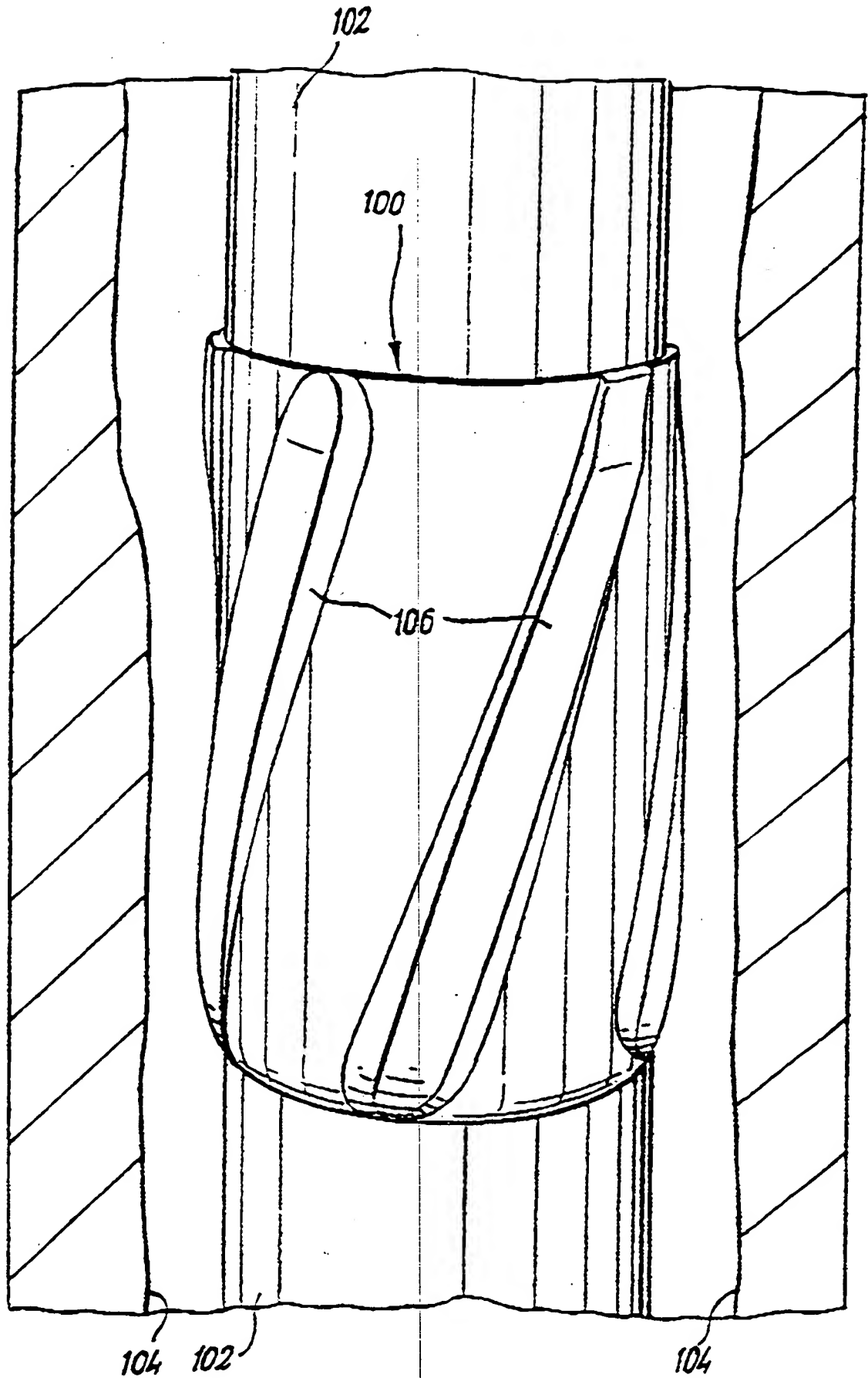
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FIG. 1

**FIG. 2****FIG. 3**

**FIG. 4****FIG. 5**

4/4

**FIG. 6**

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Int. Application No.

PCT/GB 98/00554

A. CLASSIFICATION OF SUBJECT MATTER

IPC 6 E21B17/10 E21B17/22

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 6 E21B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	GB 2 288 198 A (HYDRILL COMPANY) 11 October 1995 see page 2, line 27 - line 33 see page 3, line 15 - page 4, line 2 see page 5, line 31 - page 6, line 9 see page 6, line 15 - line 16 see figures 1,3,5	1-16
X	US 5 247 990 A (SUDOL) 28 September 1993 see column 3, line 41 - line 44 see column 2, line 61 - column 3, line 15 see figures 2-15	1,2,5, 8-11, 13-16

☒ Further documents are listed in the continuation of box C.

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Date of the actual completion of the international search

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X	<p>US 4 938 299 A (JELSMA) 3 July 1990</p> <p>see column 4, line 22 - line 31 see column 6, line 25 - line 27; figures 1,2</p>	<p>1,2, 6-11, 13-16</p>
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